

DOCUMENT CONTROL INFORMATION:

.....1551-Rev. 1 (MOC #)

.....1551 Incident Analysis Report Template-Plantwide.docx

.....APPROVER: - Safety Supervisor

.....REVIEWER: - Process Safety Specialist

.....REVIEWER: - Environmental Regulatory Specialist

.....REVISION COMMENTS: Added #continuous work shifts, plant tenure, and experience in current role.- Suzanne Hansen 8/28/2015

PLANT WIDE INCIDENT ANALYSIS REPORT

Monsanto, Soda Springs, Idaho Plant

Subject: Nuclear Source Exposure

Report Date: 10/27/2016

Date of Incident: 9/27/2016

Time of Incident: Approximately 1:30 PM

Date of Analysis (when GIR is initiated): 9/27/2016

GIR #: 211739

CAR Study: 10362

Weather Conditions: Clear, sunny.

Company: Monsanto

Facility Location: Soda Springs, ID

Department: Department 10

Department Area: Coke Fines Bin

Number of Continuous Shifts: 2

Plant Tenure: 6 years w/Bear River

Experience in Current Role: 6 years

Approval Signatures:

ESH BUL: _____

Date: 11/2/2016

Impacted Area BUL: _____

Date: 11/2/16

Plant Manager: _____

Date: 11/2/16

Plant Manager's Comments:

Event Classification:

☒ Monsanto Plant

☐ First Aid Case

☒ Near Miss

☐ Property Loss

☐ Rock Springs

☐ Recordable

☐ Fire

☒ Contractor

☐ Quarry

☐ Restricted Duty

☐ Explosion

☐ IH

☐ Mine

☐ Lost Workday Case

☒ Spill/Release

☐ Other

Event Statement: On Tuesday, September 27, at about 1:30 PM an electrical contractor detached the moisture analyzer (device) from the Coke Fines bin. The nuclear source inside the device was thought to be fully retracted inside the device and safely shielded but when the device was tipped down the cylinder containing the source slid outside of the device exposing the contractor to neutron radiation.

Event Description In Detail:

An engineering design firm, G-10 Engineering, specified Berthold moisture sensor LB7409-3 for the Coke Fines bin to meet Monsanto's request for moisture detection on the bin. The device requires a dip tube that extends into the bin to measure the moisture and has a neutron emitting nuclear source made of Americium-241 and Beryllium. The device arrived at Monsanto and was

DOCUMENT CONTROL INFORMATION:

.....1551-Rev. 1 (MOC #)

.....1551 Incident Analysis Report Template-Plantwide.docx

.....APPROVER: - Safety Supervisor

.....REVIEWER: - Process Safety Specialist

.....REVIEWER: - Environmental Regulatory Specialist

.....REVISION COMMENTS: Added #continuous work shifts, plant tenure, and experience in current role. - Suzanne Hansen 8/28/2015

installed on November 20, 2015 by Bear River electricians under the supervision of the plant RSO (Radiation Safety Officer).

On June 15, 2016 a field service technician from Berthold arrived at the plant to commission the device. The nuclear source would not slide forward so the device was removed and a factory installed plug was found in the tube preventing the nuclear source from going forward. The work was done by a Bear River electrician under the supervision of the Berthold technician. The plug was removed, the device was re-installed and another attempt to push the nuclear source forward was made but again it would not slide into position. The device was removed and it was found that the dip tube was bent, preventing the source from going forward. The device would not work with a bent dip tube so the project engineer decided to halt the commissioning of the device. The device was bolted back to the coke bin but the plug was not reinstalled. The field service technician retracted the source and turned the key into the locked position and gave the key to the project engineer. It is possible to turn the key into the locked position without the source being fully retracted and there is no visual indicator to confirm that the source is in the fully retracted position. The field service technician failed to tell Monsanto that it would be necessary to reinstall the plug in order to shield the source when the device was detached from the bin, regardless of whether the source was retracted or not. After reattaching the device, the Berthold field service technician took measurements to confirm that the device was not emitting any radiation on June 16, 2016.

On June 20, 2016 at the bi-weekly Coke Fines Project meeting it was decided that:

- Moisture detection on the Coke Fines bin was not critical;
- The device would not be commissioned;
- The bent dip tube would be removed;
- The associated bin flange would be blinded and
- The device would be bolted back to the blinded flange until longer-term decisions were made for its use.

On September 27, 2016 Bear River electrical contractors prepared to do the job of detaching the device, removing the dip tube, installing the blind flange and temporarily reinstalling the device to the blinded flange on the side of the bin. The plant RSO was not aware the work was happening that day and was not present for the work. The project engineer and the electrical contractors believed that the nuclear source was locked in the retracted position and shielded and the device was safe to handle without risk of being exposed to radiation. The electrical contractors completed a JSA (Job Safety Analysis) at the beginning of the day. After their lunch break they brought a man-lift to the bin and waited while the bin was emptied. One electrician positioned the lift for detaching the device while the other one was below putting up barricade tape. No radiation measurements were taken before, or during the work, and no radiation survey device was present when the work was taking place. The device was connected to a come-along to support the weight when it was detached. When it was detached, at about 1:30 PM, the device tilted down and pointed away from the contractor. After detaching the device the contractor worked to remove the dip tube but found it could not be removed because it was jammed in place. The contractor then noticed a cylindrical object protruding out from the face of the

DOCUMENT CONTROL INFORMATION:

.....1551-Rev. 1 (MOC #)

.....1551 Incident Analysis Report Template-Plantwide.docx

.....APPROVER: - Safety Supervisor

.....REVIEWER: - Process Safety Specialist

.....REVIEWER: - Environmental Regulatory Specialist

.....REVISION COMMENTS: Added #continuous work shifts, plant tenure, and experience in current role.- Suzanne Hansen 8/28/2015

device. He tried to pull it back with the cord but it would not move so he pushed it back into the device with a wrench and secured it with some barricade tape (see photo #2). He then contacted the project engineer who came and took pictures of the device and sent them to Berthold.

Berthold told the project engineer that the protruding cylinder was the nuclear source (the source is imbedded in the cylinder) and instructed the project engineer to immediately attach the device back to the side of the bin, which was done.

Berthold dispatched a representative to come and investigate the problem. On the morning of Wednesday, 9/28/2016, the plant RSO made a precautionary telephone notification to the NRC under 10 CFR 30.50. The NRC also dispatched an investigator to investigate the incident.

On Thursday, September 29, 2016, the Berthold representative and the NRC investigator arrived at Monsanto. Initial readings of the device did not show abnormal radiation levels. The bolts holding the device in place were loosened and the device was slid back to take additional radiation readings. After the readings were taken the device was slid back against the tank and the bolts were re-tightened so the device was secured to the side of the tank. The Berthold representative then tried to fully retract the source but he noticed there was something in the way that was preventing the source from freely retracting completely. By moving the source forward and back and holding the obstruction with his finger he was able to fully retract the source and lock it into a fully retracted position with the key. Final radiation readings were measured and they matched the initial radiation measurements.

Additional Facts and Observations: *Additional factors brought forward after formal analysis*

Documents reviewed as part of the investigation:

- Safe Practices and Procedures Manual; pp. 91~92.
- Ionizing Radiation Safety Procedure 334-Rev 6
- U.S.N.R.C. Reporting Requirements

Berthold and the NRC are still trying to estimate the amount of radiation the contractor was exposed to. Estimates range from 2 milli rems to 60 milli rems.

All the other nuclear devices at the Monsanto Soda Springs plant have a shutter that can be closed and locked into place shielding the source. This device from Berthold is the only nuclear device on site that does not have this feature. The lock for this device has keys just for the device, the lock's purpose is to hold the source in a retracted – but not necessarily shielded – position. All the other devices on site also have a visual indicator that confirms the shutter is in place and the nuclear source is shielded. This device does not have a visual indicator to show it is shielded. The lock on this device only acts to hold the source in place when the source is in a retracted position, the lock can be engaged even if the source is not retracted, and the lock does not serve any shielding function.

Berthold did not communicate the purpose of the plug that it removed from the device in June 2016. After the incident, Monsanto learned that the plug acts as the shutter required to shield

DOCUMENT CONTROL INFORMATION:

.....1551-Rev. 1 (MOC #)

.....1551 Incident Analysis Report Template-Plantwide.docx

.....APPROVER: - Safety Supervisor

.....REVIEWER: - Process Safety Specialist

.....REVIEWER: - Environmental Regulatory Specialist

.....REVISION COMMENTS: Added #continuous work shifts, plant tenure, and experience in current role.- Suzanne Hansen 8/28/2015

any radiation from coming out the end of the device and that the plug should have been installed by the RSO promptly after the device was detached. The device doesn't have a separate shutter that slides into place like the other devices used on-site. The plug was lost after Berthold removed it in June 2016.

The engineering design company, G-10 Engineering, is no longer in business so the information related to the specification of this particular device is incomplete. Monsanto has not been able to confirm that G-10 fully analyzed the forces acting on the dip tube for this application.

The neutron-radiation-leak-detection equipment measured similar radiation levels around the device with the source fully retracted and with the source not fully retracted. Therefore measuring radiation levels before the job would not have shown that the source was not fully retracted.

Causal Factors/Root Causes/Corrective Actions: *Analysis Team's opinion of the root and subsequent cause of the incident Include the responsible party and the due date for completion.*

Item	Causal Factor	Root Cause	Corrective Action
1	No visual indicator that the source is locked in a fully retracted position.	Equipment Difficulty → Design Specs Need Improvement.	Responsible Party: (see below)
2	Failure to understand that the plug had to be installed in order to shield the source when the device was detached.	Human Performance → Training → Understanding Needs Improvement → Instruction Needs Improvement	Responsible Party: (see below)

Corrective Actions:

- Survey all nuclear devices at P4's facility to confirm that the devices have built-in shutters and the shutters can be locked out.
 - Responsible: ~~Donna Maynes~~, Due Date: 10/27/16 - Completed
- Evaluate whether to continue using the Coke Fines vessel moisture analyzer or to return the device to Berthold (in coordination with NRC).
 - Responsible: ~~John Smith~~, Due Date: 12/31/16
- Update the site Ionizing Radiation Safety Procedure to require that, for any future new design or style of a radiation source holder, the RSO works closely with the manufacturer to ensure a thorough understanding of the operational safety instructions unique to that device.
 - Responsible: ~~Donna Maynes~~, Due Date: 1/31/17

DOCUMENT CONTROL INFORMATION:

.....1551-Rev. 1 (MOC #)

.....1551 Incident Analysis Report Template-Plantwide.docx

.....APPROVER: - Safety Supervisor

.....REVIEWER: - Process Safety Specialist

.....REVIEWER: - Environmental Regulatory Specialist

.....REVISION COMMENTS: Added #continuous work shifts, plant tenure, and experience in current role.- Suzanne Hansen 8/28/2015

Additional Response Actions:

- A. Replace signage located at nuclear devices, removing signage that states, "Caution Radioactive Materials", and installing signage that states, "Caution Radioactive Materials, Contact RSO prior to working on or near".
 - a. Responsible: ~~_____~~; Due Date: 1/31/17
- B. Re-train all plant personnel and contractors on the requirement to coordinate any work on or near nuclear devices with the RSO.
 - a. Responsible: ~~_____~~; Due Date: 1/31/17
- C. Communicate to all plant personnel the causes and corrective actions identified in the investigation.
 - a. Responsible: ~~_____~~; Due Date 2/28/17
- D. Review the Radioactive Materials License and pursue amendments as appropriate to align license conditions with current facility operations.
 - a. Responsible: ~~_____~~; Due Date 6/30/2017

Analysis Committee: *Name and Title*

Facilitator: ~~_____~~ Reliability Engineer

Chairperson: ~~_____~~, Electrical and Instrumentation Engineer

DOCUMENT CONTROL INFORMATION:

.....1551-Rev. 1 (MOC #)

.....1551 Incident Analysis Report Template-Plantwide.docx

.....APPROVER: - Safety Supervisor

.....REVIEWER: - Process Safety Specialist

.....REVIEWER: - Environmental Regulatory Specialist

.....REVISION COMMENTS: Added #continuous work shifts, plant tenure, and experience in current role.- Suzanne Hansen 8/28/2015

PHOTO #1



DOCUMENT CONTROL INFORMATION:

.....1551-Rev. 1 (MOC #)

.....1551 Incident Analysis Report Template-Plantwide.docx

.....APPROVER: - Safety Supervisor

.....REVIEWER: - Process Safety Specialist

.....REVIEWER: - Environmental Regulatory Specialist

.....REVISION COMMENTS: Added #continuous work shifts, plant tenure, and experience in current role.- Suzanne Hansen 8/28/2015

PHOTO #2

